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Assessment of knowledge, attitude, and practice of community pharmacists toward chronic obstructive pulmonary disease

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ABSTRACT

Background: Pharmacists and physicians play an essential role in the prevention and treatment of chronic obstructive pulmonary disease (COPD). COPD is a chronic lung disorder that requires proper care. Patient counseling plays a significant role. This study was carried out primarily to evaluate three different professional traits of community pharmacists regarding COPD in twin cities (Islamabad & Rawalpindi) of Pakistan. First is the knowledge base, second is the behavior, and the third and most important is the practice. We conducted this study because no research has been previously conducted in Pakistan. The current study aims to highlight how crucial it is to assess community pharmacists' abilities for the management of COPD patients. **Methodology:** A cross-sectional survey was conducted in twin cities (Islamabad & Rawalpindi) of Pakistan and data was collected from 89 community pharmacists. In this study self-developed and pre-validated questionnaire was used to assess the KAP of community pharmacists regarding COPD. There were two sections in the questionnaire. Section 1 aimed at evaluating the socio-demographic; characteristics of the participants and Section 2 of the questionnaire contains 32 questions to assess the knowledge, attitude, and practice of community pharmacists. SPSS version 25 was used for data analysis. The relationship between socio-demographic; characteristics and KAP level was assessed using statistical analysis including Student's t-test and analysis of variance. **Results:** The response rate of our study was 55% as 89 community pharmacists agreed to participate in this study. The results showed a mean knowledge score of 10.64 ± 1.64 with a mean attitude score of 34.59 ± 3.78 and a mean practice score of 15.87 ± 2.12 . The results also revealed different percentages of the main traits, i.e., knowledge score of 25.8%, attitude score of 89.9%, and practice score of 79.8%, achieved by participants. The findings of this study revealed that males have significantly higher mean knowledge scores than females. Also, the female gender as compared to the male ($b = -0.684$) has significantly decreased

knowledge scores. *Conclusion:* Our findings revealed that most participants have moderate knowledge, good attitude, and good practice toward COPD. Young pharmacists showed a better approach than older pharmacists regarding COPD. Continuing training is still required in the COPD domain to improve the knowledge of community pharmacists.

Keywords: COPD, chronic lung disease, COPD in Pakistan, KAP COPD, COPD twin cities

1. INTRODUCTION

It is a chronic condition that is prevalent among individuals who are habitual cigarette smokers, and in COPD, irreversible dilation and damage to lung parenchyma occurs (Tiep, 1997). Long-term exposure to toxic gases, as well as other factors, including industrial pollution and, most significantly, cigarette use, are the leading causes of COPD (Vestbo et al., 2013). Breathlessness from COPD may develop, which can negatively affect the overall well-being and satisfaction of a person by limiting daily tasks and other activities (Cooper, 2009; Rabe et al., 2007). Additionally, patients may have a rise in hospitalizations, medical emergencies, mortality risk, and medical costs if the disease worsens (Price et al., 2011; Miravittles et al., 2002). According to the Global Burden of Disease Study's 2015 analysis of disability-adjusted life years, COPD was the eighth most common source of disease burden (Vos et al., 2016).

According to a systematic review and the quantitative analysis of estimates Adeloye et al., (2015), the prevalence of COPD is high and rising globally, with the Eastern Mediterranean region experiencing the most significant percentage increase between 1990 and 2010 (118.7%). Although the disease cannot be cured, it can be prevented and treated (Fathima et al., 2013). With pharmacological and non-pharmacological treatments like oxygen therapy, COPD is managed symptomatically (Thakrar et al., 2014). Patient adherence to treatment plays a significant role in achieving positive outcomes; according to a study conducted in 2009, patient adherence can lead to positive therapy outcomes (Vestbo et al., 2009). In contrast, other studies found that non-adherence raises the risk of hospitalization and exacerbations, both of which are harmful to a patient's health (Vestbo et al., 2009; Van-Boven et al., 2014). Patients with COPD continue to have low rates of treatment adherence (Van-Boven et al., 2014).

It has been established that patient education is essential to managing COPD effectively. Patients must be educated about their disease, cautionary signals and clinical manifestations, etiology, and the recommended course of action (Charles et al., 2010). Three randomized controlled trials Effing et al., (2007), Suhaj et al., (2016), Davis et al., (2016) demonstrated the beneficial effects of pharmacy-led patient education on treatment outcomes, awareness of COPD, medication adherence, quality of life, and a marked decline in emergency room visits (Jarab et al., 2012). According to estimates, there are 235 million cases of COPD worldwide, which results in 3.17 million fatalities each year. With a population of almost 200 million people, Pakistan is facing a significant burden of chronic respiratory disorders like COPD and asthma.

According to a multi-country survey, in Pakistani individuals over the age of 40, the prevalence of COPD is 2.1% (Harris et al., 2014). Community pharmacists have a crucial role in counseling, disease prevention, and management. They play a vital role in patient education, particularly about chronic diseases (Khan et al., 2019). No epidemiological research from Pakistan has previously evaluated the extent of community pharmacists' understanding of COPD. The present study was conducted to understand the knowledge, attitude, and practice (KAP) of Pakistani community pharmacists addressing COPD.

2. GENERAL STUDY DESIGN

The sample size was calculated according to the number of community pharmacists practicing in the twin cities (Islamabad & Rawalpindi) of Pakistan. An observational study was designed using a self-administrated and pre-validated questionnaire to evaluate the (KAP) of community pharmacists regarding COPD. We selected different pharmacies on a random basis from various parts of the two cities. In both cities, many pharmacies are present, with community pharmacists working there to provide healthcare facilities to the patients. At least one pharmacist was present in the pharmacies where we conducted this survey.

Sample Size

Rao-Soft was used for calculating the minimum sample size of 160 community pharmacists. The response rate was 55%, out of 160 pharmacists only 89 agreed to participate in the study. The reason for other community pharmacists not participating in the research was either a lack of interest or spare time to take part in the study.

Sample Source and Time Frame

The community pharmacists working in different pharmacies of the twin cities (Islamabad & Rawalpindi) were constituted as the sample source. All the selected pharmacists were registered with the Pharmacy Council of Pakistan. Between February and May 2022, a cross-sectional survey was conducted through a questionnaire distributed to random pharmacies in twin cities to collect data to assess the knowledge, attitude, and practice of community pharmacists towards COPD.

Inclusion and Exclusion Criteria

All the pharmacists included in the study were working in the community pharmacies of the twin cities. Only the licensed community pharmacists of the twin cities participated in the study. All pharmacists other than community pharmacists were excluded from the study. Also, the community pharmacists of all the cities other than the twin cities (Islamabad and Rawalpindi) were excluded from this study.

Survey Development

The questionnaire for the conduct of the survey was thoroughly designed by an expert team comprising one physician and three pharmacists having expertise in hospital and community pharmacy. To ensure that the questions included in the survey form are understandable and clear, a pilot study was conducted on fifteen community pharmacists before finalizing and distributing the questionnaire. The pilot study showed that there was no need for modification; therefore, the results of the pilot study were not excluded from this study.

The questionnaire comprised two sections. Questions included in Section 1 aimed at investigating the socio-demographic features of the participants, including gender, age, city, weekly working hours, years of practice in community pharmacy, and the highest level of education achieved. There was a total of 9 questions in section 1. Section 2 was aimed at assessing pharmacists' KAP toward COPD. Out of a total of 32 questions, 13 were aimed at assessing knowledge, 08 were aimed at assessing attitude, and 11 for assessing practice.

Data Collection

Before data collection, interviewers received interview skills training. The aims and objectives of the study were thoroughly explicated to pharmacists by interviewers before putting the questionnaire to them. Participants were given the self-administered survey form after getting pre-informed written consent from them. The time required to complete the questionnaire was less than 15 min. The investigator or the interviewer was available to the participant during the filling of the questionnaire to provide any further detail or clarification needed. The total KAP score for knowledge, attitude, and practice ranged up to a maximum of 15, 40, and 19, respectively. Final scores were calculated by adding the points obtained from each correct answer.

The knowledge score was calculated based on the correct option selected from the given MCQs. A 5-point Likert scale (1 = strongly disagree; 2 = disagree; 3 = neither agree nor disagree; 4 = agree; and 5 = strongly agree) was employed to figure the attitude score. There was a total of 11 questions included in the practice section. Among these 9 were based upon dichotomous keys and 2 were assessed using a 5-point Likert scale. The exact distribution of the score can be seen here [FILE]. The participants were divided into three categories based on their KAP score; poor (having less than 50% score), moderate (having a score of 50-75%), and good (with a greater than 75% score).

Data Analysis

Statistical Package for Social Sciences (SPSS) version 25 was used for Statistical analyses of the obtained data. To check the reliability of each scale Cronbach's alpha was recorded. Descriptive statistics were presented using

Percentages and frequencies for categorical variables

Mean(μ) and standard deviation(σ) for continuous measures.

Association between each continuous independent variable (KAP scores) and the sociodemographic variables was established using the student’s t-test and analysis of variance test (ANOVA). To explore the factors associated with the KAP scores, Multivariable linear regression was performed by taking: -

KAP score as dependent variable

Sociodemographic characteristics as the independent variable

Multivariable linear regression was performed in 3 models. Knowledge score, attitude score, and practice score were taken as the dependent variable in model 1, model 2, and model 3 respectively in multivariable linear regression.

Ethical Approval

The study was ethically approved by the Research Ethics Committee (REC) of The University of Lahore, Islamabad campus (Ref No # BEC/0543). The study was conducted keeping in mind the ethical concerns of the participants. All participants signed written consent proceeding to the questionnaire. In addition, no names, emails, contacts, or addresses of the participants were collected. All the responses were kept confidential and used only for research purposes.

3. SOCIO-DEMOGRAPHIC AND OTHER CHARACTERISTICS OF THE PARTICIPANTS

We distributed all 160 questionnaires to community pharmacists and collected back a total of 89, representing a response rate of 55.6%. Finally, the data of these 89 participants were used for data analysis. The sociodemographic factors and details of other characteristics are given below in (Table 1). According to the results, 64% of females and 36% of males participated in the study, of which only 15.7% were owners of the pharmacies and 84.3% were working as staff. The results also showed that most of the community pharmacists (79.8%) were Pharm. D degree holders and only 5.6% of community pharmacists have Ph.D. degrees. 60.7% of the participants said that they had received training on COPD. In addition, 85.4% of the participants had an age between 20-30 years.

Description of the KAP Scores

Knowledge Score

According to the results mean knowledge score was 10.64 ± 1.64 (median = 11; minimum; maximum = 14). The score was divided into three categories and it was found that only 3.4% of participants had poor knowledge (score< 8), 70.8% of participants had moderate knowledge (score between 8 and 11) and 25.8% had good knowledge (score> 11). It is illustrated graphically in (Figure 1).

Attitude Score

The results showed a mean score of attitudes of 34.59 ± 3.78 (median = 35; minimum = 20; maximum = 40). The score was divided into three categories and it was found that 0% of participants had a poor attitude (score < 20), 10.1% of participants had a moderate (score between 20 and 30) and 89.9 % had a good attitude (score > 30). It is illustrated graphically in (Figure 1).

Practice Score

The results of the present work exhibited the mean practice score of 15.87 ± 2.12 (median = 16; minimum = 10; maximum = 19). The score was divided into three categories and it was found that 0% of participants had poor practice (score < 10), 20.2% of participants had attitude (score between 10 and 14) which is moderate, and 79.8% had good practice (score > 14). It is illustrated graphically in (Figure 1).

Table 1 Socio-demographic and other characteristics of the participants

Variables	Frequency (n)	Percent (%)
Gender		
Male	32	36
Female	57	64
Education level		
B-Pharmacy	02	2.2
Pharm. D	71	79.8

Masters	11	12.4
Ph.d	05	5.6
Daily number of patients		
<10	33	37.1
10–50	39	43.8
50–100	13	14.6
>100	04	4.5
City		
Islamabad	52	58.4
Rawalpindi	37	41.6
Years of practice		
< 6 months	43	48.3
6 months to less than a year	22	24.7
1 year to less than 3 years	12	13.5
3 years to less than 6 years	10	11.2
6 years to less than 12 years	01	1.1
12 years or more	01	1.1
Weekly working hours		
1–16	34	38.2
17–31	25	28.1
32–40	23	25.8
>40	07	7.9
Pharmacy position		
Owner	14	15.7
Staff	75	84.3
Age (years)		
20-30	76	85.4
31-40	08	9.0
41-50	04	4.5
51-60	01	1.1
Received training on COPD?		
Yes	54	60.7
No	35	39.3

Bivariate Analysis

Knowledge

The results of the bivariate analysis showed that males have significantly higher mean knowledge scores (11.09) as compared to females (10.39). In addition, pharmacists who did not receive training on COPD showed significantly better mean knowledge scores (11.51) compared to pharmacists who received the training (10.07) (Table 2).

Attitude

The results showed that a significantly higher mean attitude score was found in community pharmacists working more than 40 hours a week (37.85) compared to other categories as shown in (Table 2).

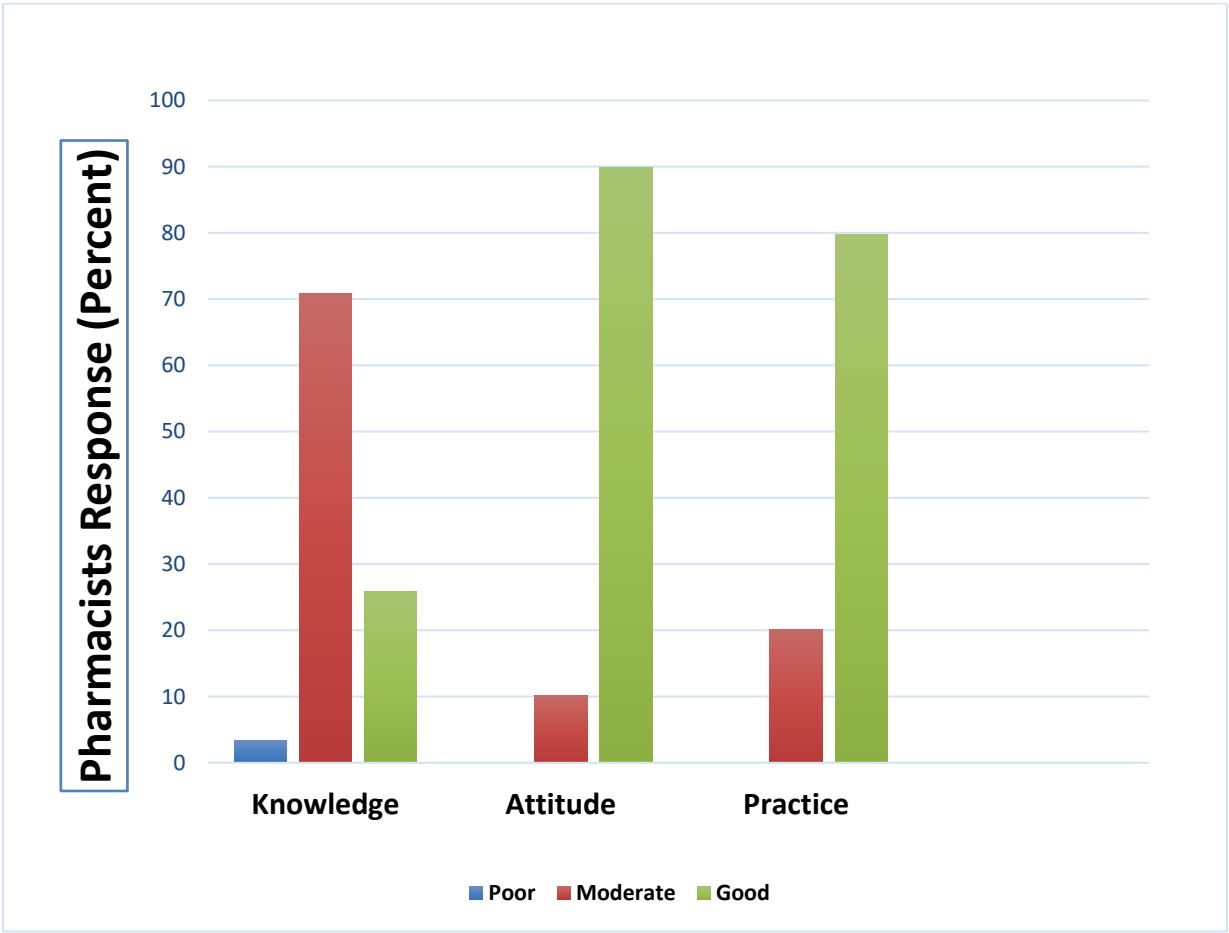


Figure 1 Division of the KAP score into poor, moderate, and good categories

Practice

The mean score of practice was found higher in pharmacists with more than 100 visiting patients per day (16.58) as compared to all other categories and in pharmacists with ages between 20 and 30 (16.09) compared to all other age groups as shown in (Table 2).

Table 2 Bivariate analysis of factors associated with knowledge, attitude, and practice scores

Variables	Knowledge (mean ± SD)	Attitude (mean ± SD)	Practice (mean ± SD)
Gender			
Male	11.09±1.78	35.06±3.92	16.16±1.85
Female	10.39±1.51	34.33±3.70	15.70±2.26
p-value	0.050*	0.385	0.335
Educational level			
B-Pharmacy	9.00±1.41	29.50±7.78	17.00±2.83
Pharm. D	10.80±1.68	34.82±3.62	15.97±2.14
Masters	10.09±1.45	34.27±4.45	15.54±1.63
PhD	10.20±1.09	34.20±2.39	14.60±2.61
p-value	0.233	0.262	0.433
Daily number of patients			
<10	10.27±1.48	35.79±3.51	16.25±1.50
10–50	10.64±1.69	33.87±4.19	15.56±2.05

50–100	11.53±1.66	34.07±2.87	14.85±2.67
>100	10.75±1.71	33.50±2.65	16.58±1.85
p-value	0.133	0.150	0.050*
City			
Islamabad	10.62±1.71	34.58±2.86	15.88±1.93
Rawalpindi	10.67±1.56	34.62±4.83	15.83±2.39
p-value	0.865	0.956	0.919
Years of practice			
Less than 6 months	10.51±1.89	34.86±3.75	15.74±2.40
6 months to less than a year	10.95±1.29	34.68±4.25	15.95±1.70
1 year to less than 3 years	10.75±1.82	32.83±3.38	16.33±1.78
3 years to less than 6 years	10.60±0.97	35.20±3.52	15.70±2.45
6 years to less than 12 years	10.00±0.00	35.00±0.00	16.00±0.00
12 years or more	9.00±0.00	36.00±0.00	15.00±0.00
p-value	0.817	0.674	0.966
Weekly working hours			
1–16	10.29±1.61	34.79±4.75	16.38±1.95
17–31	10.80±1.97	33.20±2.97	15.20±2.29
32–40	10.87±1.42	34.82±2.67	15.83±2.14
>40	11.00±1.00	37.85±1.67	15.85±1.95
p-value	0.475	0.029*	0.215
Pharmacy position			
Owner	10.28±1.82	35.21±2.26	15.43±2.31
Staff	10.71±1.61	34.48±3.99	15.95±2.09
p-value	0.381	0.507	0.405
Age (years)			
20–30	10.55±1.63	34.65±3.99	16.09±2.07
31–40	12.00±1.51	33.62±2.67	13.87±2.29
41–50	10.00±0.82	35.00±0.00	15.75±0.50
51–60	9.00±0.00	36.00±0.00	15.00±0.00
p-value	0.059*	0.870	0.041*
Received training on COPD?			
Yes	10.07±1.24	34.27±3.87	16.15±1.81
No	11.51±1.80	35.08±3.62	15.42±2.48
p-value	0.000*	0.327	0.119

Multivariable Analysis

The results of Model 1 of linear regression, taking the knowledge score as the dependent variable and other characteristics as independent variables as shown in Table 3, showed that pharmacists who didn't receive training on COPD ($\beta = 1.287$) had significantly higher knowledge scores. However, the female gender compared to male ($\beta = -0.684$) and attitude score ($\beta = -0.147$) was significantly associated with decreased knowledge score as shown in (Table 3, Model 1).

The results of Model 2 of linear regression, in which attitude score was taken as a dependent variable, showed that pharmacists working 17–31 hours weekly compared with >40 hours ($\beta = 0.005$) and pharmacists working 32–40 hours weekly compared with >40 hours ($\beta = 0.050$), were associated with significantly higher attitude scores as shown in (Table 3, Model 2). The results of Model 3 of linear regression, taking the practice score as the dependent variable, showed that pharmacists aged 20–30 years compared to those 31–

40 years ($\beta = 1.976$), were significantly associated with higher attitude scores ($\beta = 0.19$), while knowledge score ($\beta = -0.288$) was significantly associated with a decreased practice score as shown in (Table 3, Model 3).

Table 3 Multivariable analysis

Variables	Unstandardized β	Standardized β	p-value	Confidence interval	
				Lower bound	Upper bound
Model 1: Linear regression taking the Knowledge score as the dependent variable					
Received training? (No vs Yes)	1.287	0.386	0.000*	0.644	1.929
Gender (female vs male)	-0.684	-0.201	0.038*	-1.328	-0.40
Practice score	-0.147	-0.191	0.050*	-0.298	0.004
Attitude score	0.003	0.006	0.952	-0.081	0.086
Model 2: Linear regression taking the Attitude score as the dependent variable					
Gender (male vs female)	0.635	0.081	0.473	-1.115	2.384
Working 1–16 hours weekly compared with >40 hours	-2.962	-0.383	0.058*	-6.025	0.100
Working 17–31 hours weekly compared with >40 hours	-4.474	-0.535	0.005*	-7.594	-1.355
Working 32–40 hours weekly compared with >40 hours	-3.068	-0.358	0.050*	-6.208	0.072
Practice score	0.257	0.144	0.196	-0.135	0.649
Knowledge score	0.107	0.046	0.672	-0.395	0.609
Model 3: Linear regression taking the Practice score as the dependent variable					
City (Rawalpindi vs Islamabad)	-0.028	-0.006	0.950	-0.896	0.840
Gender (Male vs female)	0.843	0.192	0.078	-0.096	1.781
Age 20-30 years compared to 31-40	1.976	0.331	0.013*	0.421	3.531
Age 41-50 years compared to 31-40	1.075	0.106	0.397	-1.439	3.589
Age 51-60 years compared to 31-40	0.578	0.029	0.792	-3.774	4.931
Knowledge score	-0.288	-0.222	0.041*	-0.563	-0.012
Attitude score	0.084	0.150	0.145	-0.030	0.198

4. DISCUSSION

Previous research has shown that pharmacists have a role not only in the prevention and management of chronic obstructive pulmonary disease but also can improving the quality of care by providing proper education to patients (COPD) (Jarab et al., 2012; Hume et al., 2012; Effing et al., 2007). International studies have also shown that treatment outcomes in COPD patients can be improved by interventions of community pharmacists (Suhaj et al., 2016; Jarab et al., 2012). Furthermore, to the best of our knowledge, only two such studies have been conducted, one in Finland Heikkilä et al., (2018) and one in Lebanon Hallit et al., (2020) addressing the same topic. There is not even a single study about the KAP of community pharmacists regarding COPD in Pakistan, therefore we decided to conduct this study.

KAP Regarding COPD

It has been revealed internationally that there is a positive impact of community pharmacists' involvement on patients' health (Ottenbros et al., 2014; Van-Boven et al., 2016; Wright et al., 2015). There is an important role of pharmacists in providing drug-related information to patients and healthcare providers (Hume et al., 2012). About the previous data, it can be confirmed that through pharmacist counseling we not only increase patient adherence (Van-Boven et al., 2016). But also, can reduce the financial burden by decreasing the number of physician visits (Wright et al., 2015). Also, the 10-year COPD program in Finland showed significant positive results: smoking habits were reduced in male as well as female patients, the quality of diagnosis was improved and COPD-related hospitalizations were reduced (Kinnula et al., 2011).

All healthcare providers including pharmacists must know the importance of seeking trustful scientific information. Thus, it is needed for hours that pharmacists must understand where to find the most recent treatment guidelines and how to give patients sound advice based on reliable scientific data (Moreo et al., 2016; Vainio et al., 2001). Our findings revealed that 25.8% of the community pharmacists had good knowledge of COPD which is comparable to the results (29.9%) of another study conducted in Lebanon (Hallit et al., 2020). A slightly low knowledge score as compared to the Lebanese study may be due to the difference in the developing status of the two countries. Some other studies that were conducted in Europe reported that the level of knowledge does not meet the standard criteria. So, ongoing training programs must be organized to equip pharmacists with optimal knowledge regarding treatment guidelines and as well as patient counseling (Kurko et al., 2010; Verma et al., 2012).

About 93.2% of pharmacists agreed that smoking and air pollution are the leading causes of COPD and this result is much more similar to a Finnish study (Heikkilä et al., 2018). Our study revealed that 89.9% of pharmacists have good attitude scores while the study conducted in Lebanon showed that only 48.9% of participants had a positive attitude toward COPD (Hallit et al., 2020). Our results showed that 79.8% of the participants had good practice and 0% had poor practice which is significantly different than the results revealed by the findings of Hallit et al., (2020) which showed that 20.2% of participants had good while 40.9% had poor practice.

According to the results, it can be observed that most pharmacists counsel their COPD patients regarding the use of medication such as correct use of inhalers, compliance towards steroids, and drug safety. Pharmacists were also educating their patients about the importance of nutrition, smoking cessation, and physical activity, which are equally important as stated by international guidelines (Rabe et al., 2007). The findings of some other studies have shown that healthcare professionals including pharmacists focus more on counseling related to medication rather than changes in patients' lifestyles Chong et al., (2014), while the modern approach suggests that pharmacy professionals place more emphasis on overall health and not only on medications in chronic diseases (Smith and Olin, 2010).

KAP Relationship Regarding COPD

The present study revealed a significant relationship between pharmacists aged 20-30 years (compared to 31-40 years) and practice scores. Similar results were seen in a study conducted in Indonesia to assess the KAP of community pharmacists toward their current function and performance (Athiyah et al., 2019). The findings of the present work showed a significant but negative relationship between the female gender and practice score with that knowledge score. However, these results contradict the study conducted in Lebanon where a significant positive relationship was found between practice score and knowledge score (Hallit et al., 2020). The difference in results might be because inadequate training is being provided to the health care providers including the community pharmacists regarding COPD. However, these results resemble a study conducted in Nepal to assess the KAP of health professionals toward pharmaco-vigilance (Palaian et al., 2011).

5. CONCLUSION

Our findings revealed that most of the participants have moderate knowledge, good attitude, and good practice towards COPD. Young pharmacists showed better practice as compared to older pharmacists regarding COPD. Also, continuing training is still needed to enhance the knowledge of community pharmacists regarding COPD. It will help pharmacists to manage and treat patients with COPD in a better way. There is a need to redesign the COPD training courses for pharmacists at the top task of administrators of the health of the country.

Strengths of the Study

This is the first study that was conducted in Pakistan to assess the KAP of community pharmacists toward COPD. No other such study has been reported to date. While distributing the questionnaire, the interviewer was made available to the participants for any further queries so in this way the chances that participants might be ambiguous about a certain question were eliminated. It can be estimated from our study that there is a need for proper training for community pharmacists regarding COPD so that they can provide proper counseling to their patients. These are the strengths of our study.

Limitations of the Study

This study was carried out in only two main cities (Rawalpindi & Islamabad) of Pakistan, and the other cities and provinces of Pakistan were not included, hence we cannot generalize the results of this study for the whole country. We only checked the KAP of community pharmacists regarding COPD and all other pharmacists were excluded from the study. This is also a limitation of our study. A sample size of 89 participants was used in the study. It would have been better if a larger sample size was there.

Practice Implications and Future Studies

Although most respondents have moderate knowledge and some showed poor knowledge as well, there is a need to arrange proper education and training sessions (particularly regarding clinical guidelines) for pharmacists about COPD to improve their patient-oriented counseling practice. It has been shown by different studies, that healthcare providers including pharmacists who had proper knowledge about current care guidelines, helped their patients in a better way (Moreo et al., 2016; Kurko et al., 2010; Rahaman et al., 2017). Also, systematic review findings demonstrated that community pharmacists might positively influence individuals at risk for chronic obstructive pulmonary disease by effectively screening them (Fathima et al., 2013). The findings have also revealed that community pharmacists can offer an effective role in smoking cessation and the management of COPD in at-risk patients (Fathima et al., 2013).

As this study was conducted on the community pharmacists of only two cities (Rawalpindi & Islamabad) of Pakistan, it is recommended to carry out the study in other cities and provinces of Pakistan using a larger sample size so that the study can be generalized for the whole country. It is also recommended to redesign the COPD training courses for pharmacists as well as for patients so that better patient-oriented outcomes can be achieved by proper counseling of the patients by healthcare workers (including the pharmacists). The training courses should include aspects related to the importance of physical exercise, smoking cessation, and medication counseling on each patient's status so that pharmacists are better able to communicate and handle these problems with COPD patients. In addition, the KAP study should also be performed on other healthcare professionals and patients as well, regarding COPD to identify the need for counseling and education for healthcare professionals and patients.

Abbreviations

KAP: Knowledge, attitude, and practice; ANOVA: Analysis of variance test; COPD: Chronic obstructive pulmonary disease

Ethical approval and consent for publication

The datasets generated and/or analyzed during the current study are not publicly available due to the privacy of the participants but are available from the corresponding author at reasonable request.

Consent for publication

Not applicable

Authors' Contribution

Ayesha Sana and Laiba Asif prepared and reviewed the questionnaire. Ayesha Nazeer and Muhammad Bilal collected the data. Muhammad Sufyan and Ayesha Sana analyzed the data and wrote the manuscript with the help of Dr. Kashif Iqbal and Najam Us Sahar. All authors participated in reading and critically revising the manuscript and approving the final version. All authors agreed to be accountable regarding all aspects of the study.

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Informed consent

Not applicable.

Conflicts of interests

The authors declare that there are no conflicts of interests.

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Data and materials availability

All data associated with this study are present in the paper.

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